

heating an object to be heated, toward the heating surface,

a bottom portion of said bottomed hole formed relatively nearer to the heating surface than the heating element, and

a temperature-measuring element included in said bottomed hole and pressed on the bottom portion of said bottomed hole.

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#### REMARKS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1-5, 8, and 10 are presently active, Claim 1 having been amended and Claims 6, 7, 9 and 11 having been canceled by the present amendment.

In the outstanding Office Action, Claims 1-3, 8, and 11 were rejected under 35 U.S.C. §102(b) as being anticipated by Ushikoshi et al (U.S. Pat. No. 5,306,895). Claims 4, 6, and 7 were rejected under 35 U.S.C. §103(a) as being unpatentable over Ushikoshi et al in view of Arena et al (U.S. Pat. No. 5,635,093). Claim 5 was rejected under 35 U.S.C. §103(a) as being unpatentable over Ushikoshi et al in view of Yoshida et al (U.S. Pat. No. 6,080,970). Claims 9 and 10 were rejected under 35 U.S.C. §103(a) as being unpatentable over Ushikoshi et al in view of Hecht et al U.S. Pat. No. 5,877,475).

Firstly, Claim 1 has been amended to include a feature similar to the feature previously recited in Claim 9. As such, Claim 1 defines a ceramic heater having a ceramic plate including a heating element formed inside the ceramic plate, a bottomed hole made toward a heating surface for heating an object to be heated, a bottom portion of the bottomed hole formed relatively nearer to the heating surface than the heating element, and a temperature-measuring element included in the bottomed hole and pressed on the bottom

portion of the bottomed hole. As noted in Applicants' specification, other methods of attaching temperature-measuring elements to ceramic plates have been used. In particular, the specification states that:

When the temperature-measuring element is fixed with a resin, a ceramic, a solder material or the like, it is apprehended that such a material will deteriorate thermally so that the temperature-measuring element may fall away. However, in the case that a physical method such as pressing is used, such a problem is not caused. Thus, such a case is favorable.<sup>2</sup>

Furthermore, since ceramic plates are most likely sintered, the surface of the ceramic plate has irregularities due to the existence of pores or crystal grains. Thus, even if a temperature measuring element (i.e. a thermocouple) contacts the surface of the ceramic plate, due to the surface irregularities, a precise temperature measurement is not possible because a space is formed between the temperature measuring element and the irregular surface.

Since the temperature measurement element as claimed is pressed on the surface, the above-mentioned space does not exist, and a precise temperature measurement is realized. Heat can be transmitted readily from the ceramic plate to the temperature measurement element. As such, a measured temperature closer to the actual temperature of the ceramic plate than a measured temperature for a temperature-measuring element merely contacting a surface of the ceramic plate is obtained. Furthermore, the bottom portion of the bottomed hole, as defined in Claim 1, is nearer to the heating surface than the heating element. Thus, the temperature-measuring element defined in Claim 1 is less influenced by temperature changes of the heating element in the ceramic body.

Applicants submit that the feature of a temperature-measuring element being pressed on a bottom portion of a bottomed hole of a ceramic plate is not taught or suggested in the

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<sup>2</sup>Specification, page 10, lines 16-22.

applied prior art.

Ushikoshi et al depict in Figure 1 a thermocouple 10 housed in a sheath 9. Upon securing the flange 13 to the housing 1, the sheath holding the thermocouple is placed in contact with the ceramic substrate 4. However, there is no disclosure in Ushikoshi et al for having the temperature measuring element (i.e. the thermocouple and sheath) pressed on a bottom portion of a bottomed hole in the ceramic substrate 4, as defined in Claim 1. Indeed, the outstanding Office Action acknowledges that Ushikoshi et al do not disclose a temperature sensor being pressed by an elastic body or screw.<sup>3</sup> Thus, in Ushikoshi et al, the above-mentioned space formed between the thermocouple and the bottom surface of the bottomed hole of the heater is not precluded. Accordingly, the thermocouple contact in Ushikoshi et al differs distinctly from the pressed temperature-measuring element defined in Claim 1.

For a teaching of a temperature sensor being pressed by an elastic body or screw, the outstanding Office Action relies on Hecht et al.<sup>4</sup> However, Hecht et al disclose in Figures 5 and 6 a spring which presses an inner sleeve 16, and not the thermocouple element 12, against the back side of a ceramic plate 3. Further, Hecht et al disclose that the thermocouple element 12 is embedded in its outer end in an insulating material 19 within the inner sleeve 16 and bears in punctiform contact against the underside of the glass ceramic plate 3.<sup>5</sup> Applicants submit that the temperature measurement element (i.e. the thermocouple element 12) in Hecht et al is not pressed on, but rather adhered to a ceramic plate. Thus, in Hecht et al, a precise temperature measurement is dependent on the insulating material 29 for its

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<sup>3</sup>Office Action, page 3, lines 20-21.

<sup>4</sup>Id., page 3, lines 22-23.

<sup>5</sup>Hecht et al, column 4, lines 27-30.

contact and adhesion to the ceramic plate, which as previously noted in Applicants' specification is prone to failure.

Thus, neither Ushikoshi et al nor Hecht et al disclose or suggest a temperature-measuring element included in a bottomed hole of a ceramic plate and pressed on the bottom portion of the bottom portioned hole, as defined in Claim 1.

Accordingly, it is respectfully submitted that Claim 1 is not made obvious by a combination of Ushikoshi et al and Hecht et al.

Thus, Claim 1 and Claims 2-5, 8, and 10 which depend from Claim 1 patentably define over the applied prior art.

Consequently, in view of the present amendment and in light of the above discussions, the outstanding grounds for rejection are believed to have been overcome. The application as amended herewith is believed to be in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,  
MAIER & NEUSTADT, P.C.



Gregory J. Maier  
Registration No. 25,599  
Eckhard H. Kuesters  
Registration No. 28,870  
Attorneys of Record  
James D. Hamilton  
Registration No. 28,421



**22850**

Fax #: (703) 413-2220

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IN THE CLAIMS

Please amend the claims as shown below:

1. (Amended) A ceramic heater comprising:

a ceramic plate [and] including,

a heating element formed inside [thereof] the ceramic plate,

[wherein:]

a bottomed hole [is] made, being directed from [the] an opposite side to a heating surface for heating an object to be heated, toward the heating surface[;], [the]

a bottom portion of said bottom portioned hole [is] formed relatively nearer to the heating surface than the heating element[;], and

a temperature-measuring element [is set up] included in said bottomed hole and pressed on the bottom portion of said bottomed hole.

6. (Canceled)

7. (Canceled)

9. (Canceled)

11. (Canceled)